

Rec'd PCT/PTO 17 DEC 1996

08/765584

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)		PORT012	
INTERNATIONAL APPLICATION NO. PCT/EP95/01985	INTERNATIONAL FILING DATE 26 May 1995	PRIORITY DATE CLAIMED 20 June 1994	
TITLE OF INVENTION: DETECTOR FOR A MEASURING DEVICE			
APPLICANT(S) FOR DO/EO/US Helmut Kubisiak			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items under 35 U.S.C. 371:			
1. <input checked="" type="checkbox"/> This express request to immediately begin national examination procedures (35 U.S.C. 371(f)).			
2. <input checked="" type="checkbox"/> The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees as follows:			
CLAIMS	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA
TOTAL CLAIMS		19	0
INDEPENDENT CLAIMS		2	0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)):			
<input type="checkbox"/> For filing with EPO or JPO search report (37CFR 1.492(a)(5)).....		\$ 910.00	910.00
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482)		\$640.00	
<input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))..		\$710.00	
<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37CFR 1.445(a)(2)) paid to USPTO.....		\$950.00	
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Articles 33(2)-33(4)...		\$90.00	
Surcharge of \$130.00 for furnishing the National fee or oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).			0.00
TOTAL OF ABOVE CALCULATIONS		=	910.00
Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (Note 37 CFR 1.9, 1.27, 1.28).			455.00
SUBTOTAL		+	455.00
Processing fee of \$130.00 for furnishing the English translation later the <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			
TOTAL NATIONAL FEE		\$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)).		+	40.00
TOTAL FEES ENCLOSED		\$	495.00
a. <input checked="" type="checkbox"/> A check in the amount of \$ 495.00 to cover the above fees is enclosed			
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.			
c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.			

3. A copy of the International Application as filed (35 U.S.C. 371 (c)(2))
- ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - ☐ is not required, as the application was filed in the United States receiving Office (RO/US).
 - ☐ has been transmitted by the International Bureau.
4. ☒ A translation of the International Application into English (35 U.S.C. 371 (c)(2)).
5. Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
- ☐ are transmitted herewith (required only if not transmitted by the International Bureau)
 - ☐ have been transmitted by the International Bureau.
6. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
7. ☒ An oath or declaration of the inventor (35 U.S.C. 371(c)(4)).
8. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Other document(s) or information included:

9. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. ☒ An assignment document for recording.
PLEASE MAIL THE RECORDED ASSIGNMENT DOCUMENT TO:
- ☒ the person whose signature, name and address appears at the bottom of this page.
 - ☐ the following:

11. The above checked items are being transmitted:

- ☐ before the eighteenth (18) month publication.
- ☐ after publication and the Article 20 communication but before twenty (20) month from the priority date.
- ☐ after twenty (20) months but before twenty-two (22) months (surcharge and/or processing fee included).
- ☐ after twenty-two (22) months (surcharge and /or processing fee included).

NOTE: Petition to revive (37 CFR 1.137(a) or (b)) is necessary if 35 U.S.C. 371 requirements submitted after 22 months and NO proper demand for International Preliminary Examination was made by 19 months from the earliest claimed priority date.

- ☒ by thirty (30) months and a proper demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
- ☐ after thirty (30) months but before thirty-two (32) months and a proper demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date (surcharge and/or processing fee included).
- ☐ after thirty-two (32) months (surcharge and/or processing fee included).

NOTE: Petition to revive (37 CFR 1.137(a) or (b)) is necessary if 35 U.S.C. 371 requirements submitted after 32 months and a proper demand for International Preliminary Examination was made by 19 months from the earliest claimed priority date.

12. At the time of transmittal, the time limit for amending claims under Article 19:
- ☐ has expired and no amendments were made.
 - ☐ has not yet expired.

13. ☐ Certain requirements under 35 U.S.C. 371 were previously submitted by the applicant on _____, namely:

MARCUS & ASSOCIATES
NAME 225 Metcalfe Street, Suite 309
ADDRESS Ottawa, Ontario, Canada
K2P 1P9
SIGNATURE *Martin J. Marcus* 18823
REGISTRATION NUMBER

Applicant or Patentee: Helmut Kubisiak Attorney's PORT012
Serial or Patent No.: _____ Docket No.: _____
Filed or Issued: _____
For: DETECTOR FOR MEASURING DEVICE

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) and 1.27(c)) — SMALL BUSINESS CONCERN

I hereby declare that I am

- ☒ the owner of the small business concern identified below:
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN BETARAY KUBISIAK GMBH

ADDRESS OF CONCERN Neuenburger Strasse 30/1,
D-75335 Döbeln (DE)

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled _____

DETECTOR FOR A MEASURING DEVICE

by inventor(s)

Helmut Kubisiak

described in

- ☒ the specification filed herewith
☐ application serial no. _____, filed _____
☐ patent no. _____, issued _____

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME _____

ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

NAME _____

ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING x Helmut Kubisiak

TITLE OF PERSON OTHER THAN OWNER x CEO

ADDRESS OF PERSON SIGNING x Neuenburger Straße 30/1

D-75335 Döbeln

SIGNATURE x Helmut Kubisiak DATE x 6 Dec 1996

Detector for a Measuring Device

Description:

The invention relates to a detector for a device used to measure radioactive areas, said device having two electrodes between which a voltage is applied, and having also a counter gas between the electrodes.

The measuring of radioactive areas is carried out in particular to determine radioactive thin-film plates, paper chromatograms, electrophoretograms, thin sections of small organisms, DNA plotting strips or contamination. For this purpose, a Geiger-Müller counter or a proportional counter tube is used. These measuring devices are moved slowly over the surface to be measured and the radioactivity measured is recorded, for example, by a rate meter, counter and plotter.

When an area is measured by means of a proportional counter tube, the latter is incrementally advanced along the pathway to be scanned. Another possibility is to use several individual counter tubes arranged one behind the other.

It is further known in the art that radioactive areas on surfaces can be determined with the aid of a wire mesh detector (multiwire detector). In the radioactive zones, the counter gas between the suspended wire meshes, which are insulated from each other, becomes ionized and the location of the radioactive areas in the wire mesh can be displayed on a screen using known electronic methods of measuring radioactivity. The local distribution of the radioactivity in a sample can also be recorded photographically.

It is also known in the art that the distribution of radiation on surfaces can be measured by applying a layer of photographic emulsion which is blackened by the radiation (autoradiography). However, the disadvantage of this method is that, depending on the amount of activity, long exposure times of up to several months have to be tolerated. In the recent past, autoradiography has been further developed. In order to avoid long exposure times, a layer of phosphorus, for example, is used; electrons in this layer of phosphorus become excited and can be converted into an optical image by scanning them with a laser beam.

The disadvantage of this method, however, is that quantitative determination of the local distribution of the radioactivity is unsatisfactory.

When a multiwire detector is used, the spatial resolution of closely adjacent areas of radioactivity is poor, because obliquely incident radiation also triggers ionization of the gas. An attempt is made to eliminate this deficiency by using a multi-hole collimator between the radioactive surface and the detector. However, this has the disadvantage that the sensitivity of the measuring device is considerably reduced. In addition, it has been discovered that the lack of rigidity and stability of wire meshes used as electrodes can give rise to problems as regards the reproducibility of the measurements.

The purpose of the present invention is to develop the detector to such an extent that the local resolution is further improved. In addition, the purpose is to improve the reproducibility of the measurements.

This goal is accomplished by means of a detector for measuring radioactive areas, said detector having the features described in

Claim 1. Advantageous refinements of the invention are described in the sub-claims.

The detector according to the invention is characterized by the fact that the electrodes are arranged on opposite surfaces of a support. In addition, channels are provided which pierce the electrodes and the support, so that the counter gas is in contact with the electrodes via these channels.

The counter gas fills the individual channels. Thus, each channel acts as both a collimator and a counter tube in which the gas is ionized once radioactivity penetrates the channel, and finally photoexcitation is triggered as a result of the avalanche effect; this can be easily and rapidly detected, for example, by known photographic methods. Via the totality of the channels in the detector according to the invention, an image is obtained of the distribution of the radioactivity over the surface to be measured. In addition, almost 100% detectability of the particles or quanta travelling vertically in relation to the measurement plane is obtained, and deterioration of the local resolution caused by particles or quanta travelling along obliquely oriented paths is prevented.

The detector as such is rigid and robust, thus guaranteeing reproducibility of the measurements.

In accordance with an advantageous further refinement, the electrodes are arranged directly on the support. The latter consists of an electrically non-conductive material. The support may consist wholly or partially of a ceramic material. Other materials, such as Teflon or epoxide, are possible.

The support may also be made of an electrically conducting material. In this case, it is proposed that a layer of insulation be provided between the electrodes and the support. The use of an electrically conductive material may be of interest if this simplifies the formation of the channels.

In accordance with a further refinement of the concept according to the invention, it is proposed that first and second electrical conductors be arranged over the channels. The first conductors extend in a first direction and the second conductors extend in a second direction. The first and second conductors form a grid-like mesh. The individual conductors are electrically insulated from each other. The individual conductors running in both directions in the same plane, which is parallel to the plane of the electrode, act as triggering electrodes for the ionization processes in the individual channels. If an ionization process is triggered in a channel, a voltage is induced at the point of intersection of the two sets of conductors; this voltage can be evaluated in an evaluation unit and can be displayed, for example, on a screen. By means of this refinement, it is possible to dispense with evaluation by photographic means. As a result, the measuring time can be reduced. It is advantageous to keep the diameter of the channels between 0.2 and 0.05 mm.

The spacing between adjacent channels is advantageously kept at 0.1 to 1 mm.

The spacing between the electrodes should preferentially be between 3 to 10 mm. However, this spacing can be adapted to the energy of the particles or quanta to be measured.

Instead of adapting the spacing between the electrodes, it is proposed that the pressure of the counter gas be varied according

to the energy of the particles or quanta to be measured. This has the advantage that, by varying the pressure, it is possible, using a detector, to measure different particles or quanta.

Advantageously, the detector is arranged in a housing, at least one wall of which is transparent to the type of radiation to be measured.

It has been discovered that the counter gas consists advantageously of a mixture of neon, helium and methane. Methane is used here as a quenching gas.

Further advantages and characteristics of the subject of the invention are explained with reference to an embodiment of the invention, as follows:

Figure 1 is a perspective view of a detector,

Figure 2 is a second view of a detector

Figure 3 is a detector mounted in a housing.

The detector 7 comprises two electrodes 1, 2 between which a voltage V is applied. The electrodes 1, 2 are arranged on opposite surfaces 4, 5 of a support 3. Channels pierce the electrodes 1, 2 and the support 3. The counter gas Z is in contact with the electrodes 1, 2 via the channels 6.

The detector 7 possesses a plurality of channels 6. The channels are formed in the two directions X and Y and are equidistantly spaced from each other. Each channel acts as a collimator and a counter tube.

First and second electrical conductors 8, 9, are arranged over the channels 6. The first conductors 8 extend in a first direction, namely the X-direction in the view presented here. The second conductors 9 extend in a second direction (Y-direction). The individual conductors 8 and 9 are electrically insulated from each other.

The points of intersection 8, 9 are positioned over the channels 6. Each individual conductor 8, 9 is connected with an evaluation unit, which is not shown here. The conductors 8 or 9 may be installed in an electrically non-conducting layer. These layers may be applied directly to an electrode. The layers may also be arranged at a distance from the electrode, as still remains to be described.

An ohmic resistore can be provided at each conductor. A constant voltage is applied to each conductor. If ionization occurs in a channel 6, a voltage is induced in the conductors 8, 9 assigned to the channel 6. From the change in voltage in the individual conductors 8, 9, it is possible to determine the location of the event.

The detector may be arranged in a housing 10. The housing 10 possesses a gas inlet 11 and a gas outlet 12. The wall 13 arranged opposite the electrode 1 is provided with an opening 14 corresponding to the electrode 1. By means of a device not shown here, it is possible to position a layer of photographic emulsion over the opening 14.

If a detector is used in a housing, as shown in Fig. 3, the inner chamber formed by the housing and a closure, not shown here, of the opening 14 must be flushed out using a flushing gas. Once the inner chamber has been flushed out, a counter gas is introduced

into the inner chamber. The gas pressure in the inner chamber is measured and held constant by a regulating means, which is not shown here, in order to achieve uniform sensitivity.

Instead of the opening 14, the wall 13 may consist of a material which is transparent to the type of radiation being measured. The housing of the detector may then be hermetically sealed so that no gas losses occur.

Claims

1. A detector for a device for measuring radioactive areas, said device having two electrodes (1; 2), between which a voltage V is applied, and also having a counter gas (Z), characterized in that the electrodes (1;2) are arranged on opposite surfaces (4;5) of a support (3), and further characterized in that channels (6) are provided which pierce the electrodes (1;2) and the support (3), and as a result the counter gas (Z) is in contact with the electrodes (1;2) via the channels (6).
2. A detector according to Claim 1, characterized in that the electrodes (1;2) are arranged directly on the support (3), and the support (3) consists of an electrically non-conducting material.
3. A detector according to Claim 1, characterized in that an insulating layer is in each case provided between the electrodes (1;2) and the support (3).
4. A detector according to Claim 1 or 3, characterized in that the support (3) consists wholly or partially of a ceramic material.
5. A detector according to one of the Claims 1 to 4, characterized by a plurality of first and second electric conductors (8;9) arranged over the channels (6), the first conductors (8) extending in a first direction (X) and the second conductors (9) extending in a second direction (Y),

and characterized also in that the conductors (8;9) are connected to an evaluation unit.

6. A detector according to one of the Claims 1 to 5, characterized in that the diameter of the channels (6) is between 0.2 and 0.005 mm.
7. A detector according to one or more of the Claims 1 to 6, characterized in that the spacing between adjacent channels (6) is 0.1 to 1 mm.
8. A detector according to one or more of the Claims 1 to 7, characterized in that the spacing between the electrodes (1;2) is adjusted, preferably in the range from 3 to 10 mm, according to the energy of the particles or quanta to be measured.
9. A detector according to one or more of the Claims 1 to 7, characterized in that the pressure of the counter gas can be varied according to the energy of the particles or quanta to be measured.
10. A measuring device having a detector according to one or more of the foregoing claims, characterized in that the detector is arranged in a housing (10), at least one wall of which is transparent to the type of radiation to be measured.
11. A measuring device with a detector according to one or more of the Claims 1 to 9, characterized in that the counter gas is a mixture of neon, helium and methane.

12. A measuring device according to Claim 11, characterized in that the counter gas contains 30-95% neon, 0-65% helium and 3.5% methane.
13. A measuring device according to Claim 12, characterized in that the counter gas contains 65.5% neon, 30% helium and 4.5% methane.

REPLACEMENT SHEET (RULE 26)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

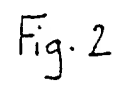
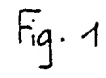


FIG. 3 is a perspective view of the device of FIG. 1, showing the array of openings 6 in the substrate 12, and the array of openings 14 in the substrate 13.

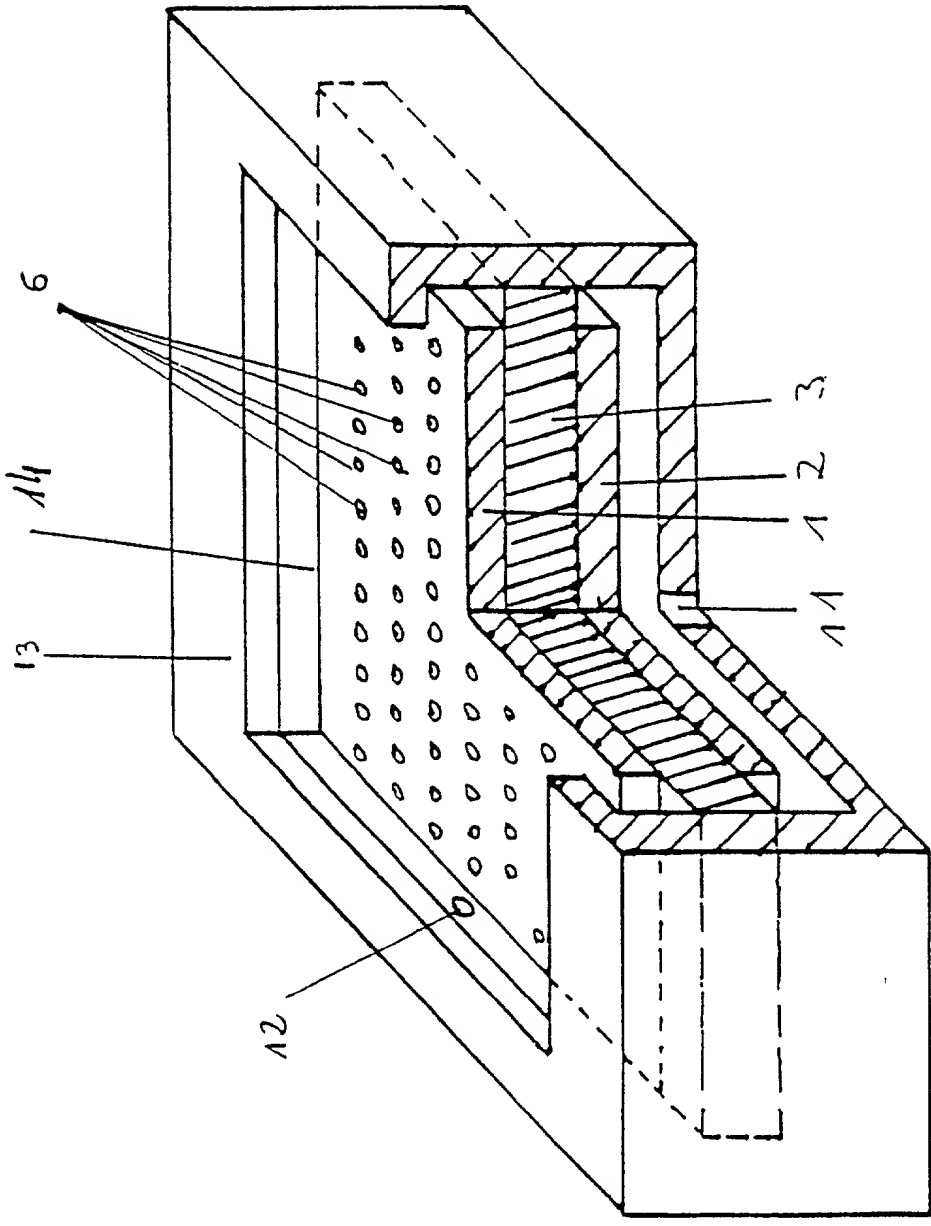


Fig. 3

10 —

RULE 63 (37 C.F.R.1.63)
DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to the name, and I believe I am the original first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

DETECTOR FOR A MEASURING DEVICE

the specification of which

(X) is attached hereto.
() was filed on _____ as U.S. Appl. Serial No. _____
() was filed as PCT Intl. Appln. No. PCT/_____
and if applicable to U.S. or PCT appln.) was amended _____
I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37C.F.R.1.56(a). I hereby claim foreign priority benefits under 35U.S.C.119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed or, if no priority is claimed, before the filing date of this application:

Prior Foreign Application(s):

Application Number	Country	Day/Month/Year Filed
P 44 23 338.8	DE	June 20, 1994

I hereby claim the benefit under 35 U.S.C.120/365 of all prior United States and PCT international applications listed above or below and, insofar as the subject matter of each of the claims of this application is not disclosed in such prior applications in the manner provided by the first paragraph of 35U.S.C.112, I acknowledge the duty to disclose material information as defined in 37C.F.R.1.56(a) which occurred between the filing date of the prior applications and the national or PCT international filing date of this application.

Prior U.S./PCT Application(s):

Application Serial No.	Day/Month/Year Filed	Status: patented, pending, abandoned
PCT/EP95/01985	26/May/1995	pending

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon. And I hereby appoint Martin J. Marcus (Reg. No. 18823) of Marcus & Associates, P.O. Box 8721, Station "T", Ottawa, Ontario, Canada, K1G 3J1, telephone number (613)232-2685 (to whom all communications are to be directed), to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent.

(1) Inventor's Signature Helmut Kubisiak Date 06 DEC 1996
Inventor's Name (typed) Helmut Kubisiak DE
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